The Bee, the Swarm, and the Cuttlefish

A note on consciousness geometry — March 2026 results before Chittka opinion.

Waldemar Lis — The Self-Experiencing Universe

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The Question

A honeybee can know that it doesn't know something. This has been demonstrated in the laboratory: when given a choice that is too difficult to resolve confidently, a bee will step back from the problem rather than guess. It monitors its own uncertainty and acts on that monitoring. This is not a metaphor — it is a measurable behavioral phenomenon.

This raises an uncomfortable question. If a bee with roughly one million neurons can do something that resembles self-monitoring, what does that tell us about the relationship between the individual bee and the swarm it belongs to? The swarm, after all, behaves with remarkable coherence — it regulates its temperature, makes collective decisions, and maintains its structural integrity in ways that look, from a distance, like the behavior of a single organism.

Are these two things — the self-aware individual and the coherent collective — the same kind of thing at different scales? Or something fundamentally different?

A Framework for Comparison

The framework I have been developing describes forms of consciousness as positions in a three-dimensional space. The three dimensions are: how stable the system's pattern of relationships is, how deeply integrated it is (whether it can be split without losing something essential), and how much it models itself — how much the system's behavior is shaped by an internal representation of the system itself.

This last dimension — self-modeling — is what the bee's uncertainty monitoring measures directly. When a bee steps back from a difficult choice, it is doing something that requires a model of its own knowledge state. It is not just responding to the world; it is responding to its own response to the world.

What the Simulation Found

Using the published experimental results on bee metacognition, I computed a position in this three-dimensional space for the individual honeybee, for the honeybee swarm as a collective, and for the cuttlefish Sepia officinalis.

The result was geometrically striking.

The individual bee is closer, in this space, to the cuttlefish than to its own swarm.

This is not because bees and cuttlefish are similar animals. They are not. It is because the dimension that most separates them — self-modeling capacity — places the swarm in a very different region of the space. The swarm is highly stable and moderately integrated, but it carries almost no self-model at the system level. No part of the swarm represents the swarm to itself. The quorum mechanisms that coordinate its decisions are not self-referential in the relevant sense: they are coordination, not self-knowledge.

The individual bee, by contrast, has earned its position in the space by demonstrating that it monitors its own epistemic state. And the cuttlefish — whose behavioral repertoire includes prospective arm substitution, unseen limb monitoring, and what appears to be an epistemic head-bob — sits at the far end of the self-modeling axis.

The Cost of Becoming a Swarm

There is something counterintuitive here that deserves to be named directly. When a bee joins a swarm, its individual self-modeling capacity does not aggregate upward into a collective self-model. It disappears at the system level.

The swarm gains something — stability, collective integration, the ability to persist through the loss of individual members. But it loses, at the system level, the thing that the individual bee had: a representation of itself as a system.

This is what the framework predicts, and what the simulation quantifies. The distance between the individual bee and the swarm, measured along the self-modeling axis, is substantial — larger than the distance between the individual bee and a cuttlefish.

Why This Matters

The standard way of thinking about collective intelligence treats it as an extension — possibly an amplification — of individual intelligence. More units, more computation, more coherence: more consciousness, or at least more of whatever consciousness depends on.

This framework suggests the opposite may be true for the specific dimension of self-modeling. Collectivization, at least in the kind of loosely-coupled biological systems studied here, trades self-modeling capacity for stability. The consciousness geometry of a swarm is not a scaled-up version of the geometry of an individual. It is a different shape.

The next empirical step is to ask whether the cuttlefish, like the bee, will step back from a choice it cannot confidently make. No one has run that experiment yet. If it is run, and if the results match the framework's prediction, the triangulation between bee, swarm, and cuttlefish will be complete — not as a proof, but as a geometry that holds.

Status

This simulation is part of the ongoing development of the Vector Consciousness Prediction framework. Full technical documentation — including all parameter derivations, numerical verifications, and methodological notes — is available to researchers on request through archive.org/details/@not_foryou.

Correspondence with Professor Lars Chittka (Queen Mary University of London) is pending. Professor Jennifer Mather (University of Lethbridge) has contributed behavioral observations on cephalopod self-modeling.